Fishery Data Series No. 96-39

Escapement and Stock Statistics for Coho Salmon of the Little Susitna River and Selected Streams of the Matanuska-Susitna Valley, Alaska, 1995

by

Larry D. Bartlett

November 1996

Alaska Department of Fish and Game

Division of Sport Fish

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

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by

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ABSTRACT

Coho salmon returning to the Little Susitna and Deshka rivers in 1995 were censused through weirs at river mile 32.5 on the Little Susitna River and river mile 17 on the Deshka River. A total of 12,266 coho salmon were censused on the Little Susitna River and 12,824 on the Deshka River. The contribution of hatchery coho salmon to the Little Susitna River census was estimated at 1,135 fish (9.3%, SE = 2.2%). An estimated 20.7% (SE = 1.7%) of harvests of Little Susitna River anglers fishing from boats were of hatchery origin. A sample of 409 coho salmon taken at the Little Susitna River weir was found to be predominantly age 1.1 (56.7%, SE = 2.5%). A sample of 343 coho salmon taken at the Little Susitna River weir was found to be predominantly age 2.1 (68.5%, SE = 2.5%). Many index escapement counts of coho salmon on selected local streams were lower than average.

Key words: coho salmon, *Oncorhynchus kisutch*, Little Susitna River, hatchery contribution, weir, run timing, escapement, escapement index, sex and age composition, mean length, coded wire tag, tag loss, tag retention.

INTRODUCTION

The Little Susitna River drainage originates at the Mint Glacier in the Talkeetna Mountains north of Palmer, Alaska and discharges into Cook Inlet approximately 7 miles east of the mouth of the Susitna River and 13 miles west of Anchorage (Figure 1). The river is approximately 110 miles long with about 70 miles open to fishing for salmon, from the mouth to the Parks Highway bridge at the community of Houston. The first 34 miles upstream from the mouth are located within the Susitna Flats State Game Refuge. The Little Susitna River supports runs of chinook salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, sockeye salmon *O. nerka*, pink salmon *O. gorbuscha*, and chum salmon *O. keta*. This report focuses mainly on the coho salmon returning to the Little Susitna River, Alaska.

The Little Susitna River supports the second largest freshwater fishery for coho salmon in Alaska, second only to the Kenai River (Howe et al. 1995). Road access to the lower reaches of the Little Susitna River improved with agricultural development in the area during the early 1980s. The harvest of, and corresponding fishing effort for, coho salmon in the lower 40 miles of the Little Susitna River also increased in step with improvements in access. In response to the increases in harvest, the Little Susitna River has been stocked annually with coho salmon since 1982 (Tables 1 and 2).

The Alaska Department of Fish and Game (ADF&G), Division of Sport Fish, began an annual creel survey of the sport fishery for coho salmon in the Little Susitna River in 1981 (Bentz 1982). An annual life-history study of coho salmon in the Little Susitna River was begun in 1982 (Bentz 1983). As part of this study, a weir was constructed in the Little Susitna River at river mile 32.5 to estimate the escapements of coho salmon. This weir was initially operated in 1986 and has been operated annually since 1988 (Bartlett 1996).

A coho salmon management plan was adopted in 1990 and implemented in 1991 (5 AAC 61.060). This management plan defines an escapement goal of 7,500 nonhatchery coho salmon for the Little Susitna River upstream of the Parks Highway bridge at about river mile 70. (In this report, nonhatchery coho salmon are coho salmon that can not be identified as part of a specific release of hatchery fish based on marked-to-unmarked ratios or tagging information.)

Data collected during this project are used to refine the management plan for hatchery and nonhatchery stocks of Little Susitna River

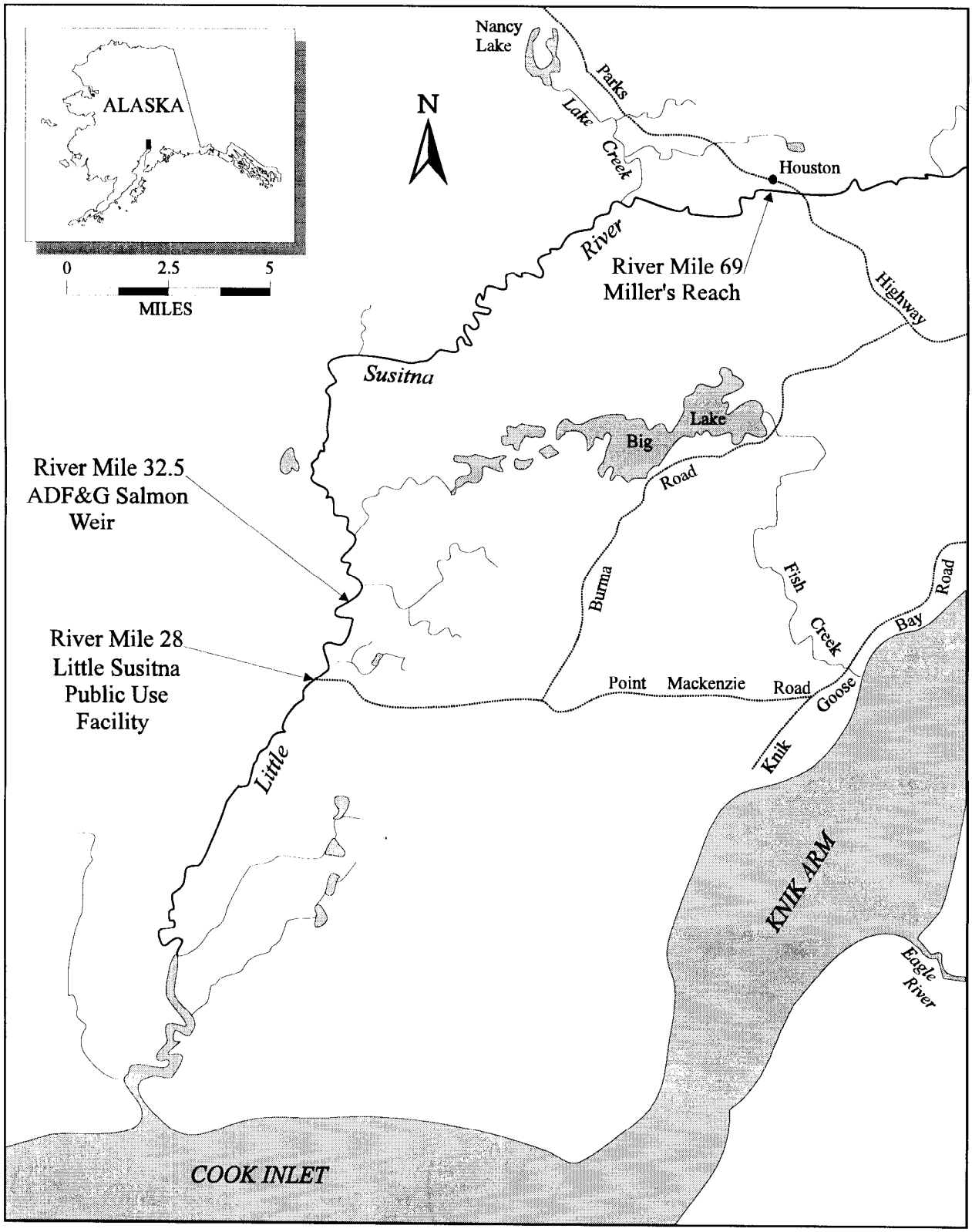

Figure 1.-Little Susitna River study area, 1995.

Table 1.-Summary of coho salmon fry released into the Little Susitna River drainage from eggs taken from the Little Susitna River and incubated at the Big Lake State Fish Hatchery.

Release Location	Date	Size(g)	Number Released	Number Marked	Tag Code
Little Susitna River	6/22/82	0.4	2,950		
Nancy Lake	6/15/83	0.5	23,652	1,880	B4-07-13
	6/16/83	0.5	80,124	4,605	B4-07-13
	6/17/83	0.6	79,251	2,622	B4-07-13
	6/22/83	0.7	67,815	5,278	B4-07-13
	6/23/83	0.7	15,666	6,450	B4-07-13
	Total		266,508	20,835	B4-07-13
Nancy Lake	6/14/84	1.0	171,194	4,026	B4-14-11
	6/15/84	0.9	164,280	5,174	B4-14-11
	6/19/84	0.9	90,742	631	B4-14-11
	Total		436,047	9,831	B4-14-11
Nancy Lake	6/18/85	0.3	127,000	10,000	B4-15-08
	5/31/85	0.3	164,600		
Horseshoe Lake	6/20/85	0.3	140,000		
	6/21/85	0.3	79,000		
	6/05/85	0.3	229,600		
	6/03/85	0.3	85,000		
Crooked Lake	6/12/85	0.3	68,000		
	6/21/85	0.3	164,000		
Butterfly Lake	6/25/85	0.3	119,000		
Delyndia Lake	6/25/85	0.3	49,000		
	Total	Nancy Lake	291,600	10,000	B4-15-08
		All Others	933,600		
Nancy Lake	6/26/86	1.0	211,255	10,300	B3-11-15
	6/27/86	1.0	105,015		
	Total	Nancy Lake			
Horseshoe Lake	5/11/88	16.4	15,725		

-continued-

Table 1.-Page 2 of 2.

Release Location	Date	Size(g)	Number Released	Number Marked	Tag Code
Horseshoe Lake	6/23/88	0.7	450,000		
Crooked Lake	7/01/88	1.0	105,000		
	7/05/88	1.3	151,000		
Nancy Lake	7/05/88	1.3	174,126	3,126	B3-02-02
	7/07/88	0.7-1.3	1,708,939	8,939	B3-02-02
East Papoose L	7/06/88	1.0	172,000		
West Papoose L	7/06/88	1.0	164,000		
Butterfly Lake	7/06/88	1.0	141,000		
Delyndia Lake	7/06/88	1.0	141,000		
Hock Lake	7/06/88	1.0	72,000		
Yohn Lake	7/06/88	1.0	46,000		
My Lake	7/06/88	1.0	58,000		
		Nancy Lake	1,883,065	12,065	B3-02-02
		All Others	1,515,725		
	1988	Total	3,398,790		
Horseshoe Lake	7/28/89	1.4	8,400		
Horseshoe Lake	6/19/90	1.0	344,000		
Crooked Lake	6/20/90	1.0	78,000		
Nancy Lake	6/28/90	1.1	155,619	11,619	13-01-01-04-05
	7/06/90	1.5	65,305	28,305	13-01-01-04-05
	7/13/90	1.7	28,722	10,722	13-01-01-04-06
	7/23/90	2.0	223,681	21,681	13-01-01-04-06
My Lake	6/29/90	1.1	23,000		
Yohn Lake	6/29/90	1.1	26,000		
Butterfly Lake	6/29/90	1.1	90,000		
Hock Lake	6/29/90	1.1	40,000		
Delyndia Lake	6/29/90	1.1	89,000		
		Nancy Lake	220,924	39,924	13-01-01-04-05
		Nancy Lake	252,403	32,403	13-01-01-04-06
		All Others	690,000		
	1990	Total	1,163,327		

Table 2.-Summary of coho salmon smolt released into the Little Susitna River drainage from eggs taken at Nancy Lake and incubated at the Fort Richardson State Fish Hatchery.

Brood Year	Eggs Incubated	Release Site	Year	Size (g)	Number Released	Number Marked	Tag Code	Return Year
1983	56,000	Nancy Lake	1985	17.1	54,394	12,151 [a]	None	1986
1984	564,000	Nancy Lake	1986	17.2	580,065	24,401 [a]	31-17-30	1987
1985	552,000	Houston	1987	19.0	98,156	7,950 [a]	31-17-45	1988
		Nancy Lake	1987	19.2	203,011	16,700 [a]	31-17-45	1988
		Total	1987		301,167	24,650 [a]	31-17-45	1988
1986	495,000	Nancy Lake	1988	20.1	446,016	24,628 [a]	31-17-61	1989
1987	537,877	Houston	1989	18.5	49,349	3,581 [a]	31-18-32	1990
		Nancy Lake	1989	20.8	305,548	22,050 [a]	31-18-32	1990
		Total	1989		354,897	25,631 [a]	31-18-32	1990
1988	462,000	Houston	1990	20.8	106,242	15,679 [a]	31-19-17	1991
		Nancy Lake	1990	20.8	202,114	29,541 [a]	31-16-01	1991
		Total	1990		308,356	45,220 [a]		1991
1989	530,315	Houston	1991	23.4	88,675	16,151 [a]	31-19-36	1992
		Nancy Lake	1991	22.9	189,087	30,207 [a]	31-19-35	1992
		Total	1991		277,762	46,358 [a]		1992
1990	590,015	Houston	1992	24.1	154,466	19,564 [a]	31-20-07	1993
		Nancy Lake	1992	23.4	158,459	19,222 [a]	31-20-06	1993
		Total	1992		312,925	38,786 [a]		1993
1991	833,883	Houston	1993	18.1	148,282	20,312 [a]	31-21-37	1994
		Nancy Lake	1993	20.2	131,591	19,930 [a]	31-21-37	1994
		Total	1993		279,873	40,242 [b]	31-21-37	1994
1992	790,000	Nancy Lake	1994	19.7	126,694	43,818 [b]	31-23-01	1995
1993	720,000	Nancy Lake	1995	21.3	151,985	45,245	31-23-39	1996

[a] Number of smolt marked (tag loss before release was not estimated).

[b] Number of marked smolt released (estimated tag loss before release has been subtracted).

coho salmon, and determine if the escapement goal of 7,500 nonhatchery coho salmon is attained.

Data collected during this project also aid in assessing the stocking program. The stocking program has contributed up to 75% (an estimated 10,660 fish) of the sport harvest (1989) and has added an inestimable number of angler-days to the sport fishery. Timely harvest, effort, and escapement information has allowed maximum use of returning hatchery stock by the angling public. This program has also enhanced recreational opportunity and social and economic benefits to the citizens.

Additional coho salmon studies reported in this report are index escapements to selected Matanuska-Susitna Valley area streams and census and biological studies conducted on the Deshka River (Figure 2).

The 1995 coho salmon program for the Little Susitna River and selected Matanuska-Susitna Valley streams had the following objectives:

1. Estimate the proportional contribution of stocked coho salmon to the sport harvest of Little Susitna River boat anglers exiting at Burma Road from 16 July through 2 September 1995,
2. Census the 1995 escapement of coho salmon in the Little Susitna River past river mile 32.5 through approximately 10 September 1995,
3. Estimate the age and sex compositions of the coho salmon escapement at the Little Susitna River and Deshka River weir sites,
4. Estimate the contribution of stocked coho salmon to the Little Susitna River coho salmon escapement past river mile 32.5 by 7-day periods,
5. Census the 1995 escapement of coho salmon in the Deshka River past river mile 17 through approximately 10 September 1995,
6. Index the coho salmon spawning escapement in the Deshka River drainage downstream of river mile 17, and
7. Index the coho salmon spawning escapement in 11 selected Northern Cook Inlet (NCI) area streams.

METHODS

STOCKING AND TAGGING

Approximately 126,694 coho salmon smolt were released in Nancy Lake (which drains into the Little Susitna River) in 1994 (Table 2). Approximately 35% of the release was tagged with a coded wire tag (CWT) and had their adipose fin removed. A single tag code (31-23-01) was used for the entire release. The dominant return-year for this release was 1995.

CENSUS OF ESCAPEMENT AT THE WEIRS

Floating weirs were used to census the escapement of coho salmon to the Little Susitna River at river mile 32.5 and the Deshka River at river mile 17. The weirs were operated from 20 May through 4 September 1995 (Appendix A). This period of operation spanned the majority of the coho salmon migration.

The weirs were a floating, resistance-board design constructed of 1-inch inside diameter, schedule 40 polyvinyl chloride (PVC) pickets fabricated in panels 4 ft wide on the Little Susitna River and 3 ft wide on the Deshka River, by 20 ft long. Picket spacing on the panels was 1.5 in. An adjustable resistance board was fastened to each panel for current

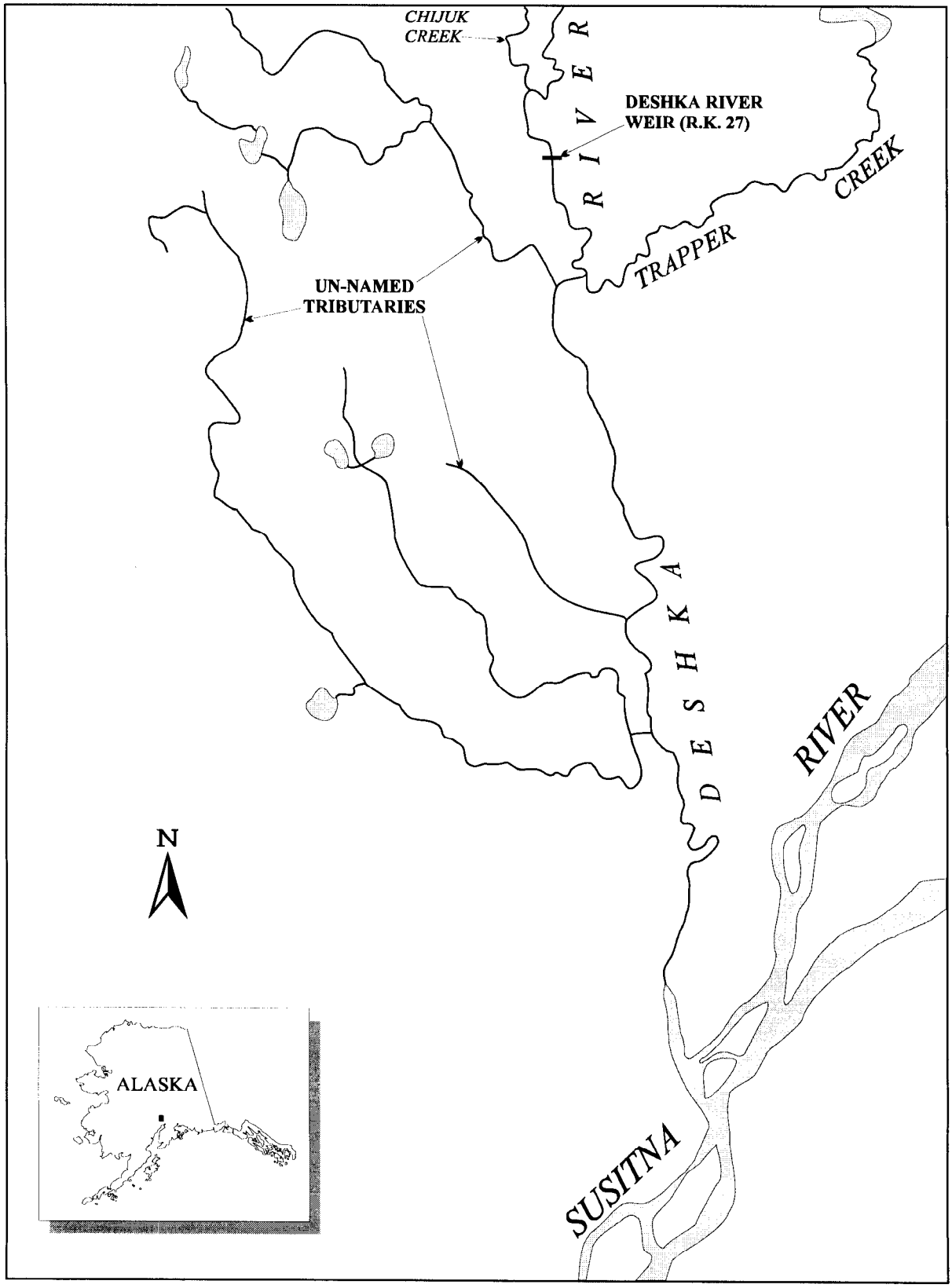

Figure 2.-Location of the Deshka River weir, 1995.

deflection and buoyancy. Panels were attached to a cable which was fastened to a railroad rail placed on the bottom of the river.

One 8 by 8 by 4 ft, partitioned live-trap with a V-shaped entrance was placed on the upstream side of each weir. Spacing between the live trap pickets was also 1.5 in. This spacing allowed for the complete census of all but the smallest 0-ocean (jack) coho salmon.

Census data were telephoned each weekday to the Sport Fish Division area office in Palmer, where they were entered into a Microsoft Excel© database.

CONTRIBUTION OF STOCKED FISH TO THE ESCAPEMENT

An escapement goal of 7,500 nonhatchery coho salmon spawners upstream of the Parks Highway is defined in the Little Susitna River Coho Salmon Management Plan. To account for an expected harvest of 500 nonhatchery fish above the weir, an estimated 8,000 nonhatchery coho were required upstream of the weir before the escapement goal was estimated to have been reached. The exact number harvested above the weir is unknown but believed to be small based on the low number of anglers fishing on this reach of the Little Susitna River.

A sample of coho salmon passing the weir was inspected for missing adipose fins. Based on previous escapements, we attempted to inspect an overall minimum of 15% of the escapement for missing adipose fins. The season was divided into 7-day strata bracketing 5 and 6 August when bait became legal. We attempted to sample about 30% of the escapement for each strata prior to 5 August to allow for the relatively small number of fish expected. An approximate 15% target was implemented after 6 August to allow for larger numbers of fish per strata.

Coho salmon missing the adipose fin were killed and their heads collected for recovery of the CWT. Recovery of tags by individual tag code was desirable to more precisely estimate the total contribution of hatchery fish of Little Susitna River origin to the escapement.

The following information was collected and recorded daily at the weir: (1) the number of salmon by species, including coho salmon, passing upstream of the weir (the number of salmon by species, including coho salmon, observed to pass back over the weir after release was subtracted from the daily count); (2) the number of coho salmon which passed over the weir during boat passage; (3) the number of coho salmon examined for a missing adipose fin; (4) the number of coho salmon observed to have a missing adipose fin; (5) the number of heads collected; (6) the number of coho salmon sampled for age and sex composition; and (7) any other pertinent factors that could have affected the ability of the weir to accurately census the passing of coho salmon upstream of river mile 32.5.

Heads collected at the weir were tagged with a numbered strap tag around the jaw at the time of collection. The number of this tag, sex, and mid-eye to fork-of-tail (MEF) length of the fish to the nearest 0.5 centimeter, was entered on a jaw tag and head record form. Heads collected were kept on ice in coolers and delivered almost daily to Palmer where they were frozen and later shipped to the decoding lab in Juneau for processing.

A portion of the fish examined for tags was also sampled for biological data (age and sex). The actual number to be examined was estimated daily by the weir crew leader. Factors that figured into the daily estimation included: (1) water (flood) conditions, (2) the previous day's passage, (3) the immediate safety of working on the weir (flood

conditions), and (4) warm water temperature and its potential effects on handling mortality.

Hatchery contribution summaries were telephoned each weekday to the Sport Fish Division area office in Palmer, where they were entered into a Microsoft Excel© database.

A rough estimate of the number of hatchery coho salmon passing the Little Susitna River weir, calculated by expanding the proportional number of hatchery fish based on the tag ratio of 0.3459 (number of fish marked in 1992 divided by the number released in 1992), was made each day. The number of nonhatchery fish was estimated daily by subtracting the estimated hatchery contribution from the daily escapement.

The final estimate of the hatchery contribution at the weir was estimated by procedures outlined in Clark and Bernard (1987; equations 10, 14, and 15). The procedures of Clark and Bernard (1987) could be followed in this case because the total number of coho salmon through the weir is known, not estimated. Chi-squared contingency table analyses were conducted on the weir database to determine if contiguous 7-day periods could be combined if necessary (due to insufficient numbers sampled or adipose finclips observed).

Contribution of Stocked Fish to the Little Susitna River Sport Fishery Harvest and Nancy Lake Egg Take

The lower 70 miles of the Little Susitna River were open to salmon fishing in 1995. Most of the sport fishing effort exited the fishery through one access point: a lower river access site (river mile 28), referred to as Burma Landing (Figure 1). A second site near Houston and third site at the Port of Anchorage were not surveyed.

Selection of the Burma Landing site focused the study effort on the majority of anglers (Bartlett and Vincent-Lang 1989; Bartlett and Sonnichsen 1990; Bartlett and Bingham 1991). The inspection of boat angler harvests began on Sunday, 16 July and continued through Saturday, 2 September 1995.

To estimate the proportional contribution of these stocked fish, coho salmon were inspected for a missing adipose fin. Coho salmon inspected were those harvested by boat anglers and checked through the Burma Landing during the scheduled inspection hours. Only the harvest of boat anglers was inspected because it was possible to inspect 100% of their harvest during the sampled periods. A complete inspection of the harvest by shore anglers during the scheduled periods was not possible because most shore anglers did not exit the fishery through the boat launch area. Shore anglers and a portion of the exiting boat anglers fished the same waters. It was therefore assumed that shore and boat anglers harvested hatchery coho salmon at the same rate. The 1995 creel inspection schedule (Appendix B) was based on results of the 1994 creel inspection.

All boat anglers exiting the sport fishery through the Burma Landing during scheduled inspection periods were contacted; there were no missed anglers. All coho salmon in a contacted angler's creel were examined for a missing adipose fin. Accurate tallies by day of both the numbers of fish examined and the numbers of fish having a missing adipose fin were kept. With the angler's permission, heads were collected from harvested fish with missing adipose fins.

Estimates of the proportional contribution of stocked coho salmon to the sport fishery of boat anglers exiting at Burma Landing were obtained by treating all inspected harvested coho salmon as if they were obtained from a

simple random sampling procedure. In 1995 the planned schedule called for a systematic sample of days and periods in the day and because all exiting boat anglers' creels were inspected, a self-weighting systematic sample was obtained.

Coho salmon were captured for the collection of eggs and sperm by seining in Nancy Lake near the mouth of Lilly Creek (Figure 1) on 21, 25 and 27 September 1995. All captured coho salmon were examined for a missing adipose fin. A missing adipose fin on the fish indicated the possible presence of a CWT. Heads from fish with a missing adipose fin were collected and sent to the tag lab for decoding.

The proportion of hatchery coho salmon in the 1994 sport harvest of the Little Susitna River and at the Nancy Lake egg take was estimated following the procedure described in Bernard and Clark (*In press*).

The relative contribution was estimated as:

$$\hat{R} = \hat{p}\theta^{-1} = \left(\frac{m}{\lambda n_2}\right)\theta^{-1}, \quad (1)$$

where:

$\hat{p}$ = an unbiased estimate of the fraction of the catch composed of the subset of a cohort that had been tagged,

θ = the proportion of hatchery released fish which contained a coded wire tag,

m = the number of coded wire tags dissected from salmon heads and decoded as originating from a hatchery release in the Little Susitna River,

n_2 = the number of coho salmon inspected for a missing adipose fin from the sampled harvest,

$$\lambda = \frac{a_2}{a_1}\frac{m_2}{m_1}, \quad (2)$$

a_1 = the number of coho salmon with a missing adipose fin which were counted and marked with a head strap,

a_2 = the number of coho salmon heads previously marked with a head strap which arrived at the tag lab,

m_1 = the number of coded wire tags which were detected in the coho salmon heads at the tag lab, and

m_2 = the number of coded wire tags which were removed from the coho salmon heads and decoded.

When θ is known (as in this study):

$$\hat{V}\left[\hat{R}\right] = \hat{V}[\hat{p}]\theta^{-2}, \quad (3)$$

where:

$$\hat{V}[\hat{p}] = \left(\frac{1}{D}\frac{n_2}{(n_2-1)}\right)\left[\left(\frac{1}{\lambda n_2}\right)\hat{p} - \left(1 - D\frac{(n_2-1)}{n_2}\right)\hat{p}^2\right], \quad (4)$$

and:

$$D = \frac{m_1(m_2-1)a_1(a_2-1)}{m_2(m_1-1)a_2(a_1-1)}. \quad (5)$$

AGE AND SEX COMPOSITIONS

When fishing is relatively good, some anglers select the fish they harvest (keep from their catch) based on size, sex, and appearance. Therefore, the age and sex compositions of returning coho salmon were not estimated from the harvest. Rather, the age and sex compositions of the coho salmon escapement were estimated by sampling at the respective weirs.

The Little Susitna River was stocked with coho salmon of hatchery origin in 1995. Returning hatchery fish are predominately age 1.1, while nonhatchery fish may be ages 1.1, 2.1, and even 3.1. Age compositions may

change over time, as the contribution of hatchery and nonhatchery fish to the harvest or weir counts change or the age composition of the nonhatchery stock varies.

A sample size of 70 fish per 7-day stratum (490 fish total) at the weir was necessary to achieve the objective criteria (Thompson 1987, Cochran 1977)[1]. Sampling of fish for age determination was spread across the 7 days of each stratum, with the objective of meeting the sample goal by the close of the last day.

The Little Susitna River sample size goal was applied to the Deshka River because estimates of coho salmon escapements to the Deshka River are unavailable.

Samples at the weirs were obtained by allowing the trap to fill with the approximate number of coho salmon for the sample (10-15 fish per day). The entire contents of the trap was then sampled to eliminate selection or behavior biases inherent in subsampling fish from the trap by dipnetting. Length and sex were determined for each fish sampled.

Coho salmon sampled for age, sex, and length were measured for MEF length to the nearest 5 millimeters (0.5 cm). Where possible, a preferred scale was taken from the left side of the body at a point on a diagonal line from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin and two rows above the lateral line (Scarnecchia 1979). If the preferred scale could not be obtained, another scale was taken from as close to the preferred scale as possible. However, scales were only taken from the area bounded dorsally by the fourth row of scales above the lateral line, ventrally by the lateral line, and between lines drawn vertically from the posterior insertion of the dorsal fin and the anterior insertion of the anal fin. If no scales were available in the preferred area on the left side of the fish, scales were collected from the preferred area on the right side of the fish. The sex of each fish was identified from external sexual characteristics.

Scales were mounted on gum cards and impressions were made in cellulose acetate as described in Clutter and Whitesel (1956). Images of the acetate impressions were enlarged using a microfiche reader. Age was described using the European method.

Estimates of age composition for the sampled coho salmon were calculated for each 7-day stratum. The proportion of coho salmon passing the weir of age u in stratum h ($\hat{p}_{uh}$), and its variance, were estimated as:

$$\hat{p}_{uh} = \frac{n_{uh}}{n^h}, \tag{6}$$

with variance (corrected for finite population) calculated as:

$$\hat{V}[\hat{p}_{uh}] = \left(1 - \frac{n_h}{N_h}\right) \frac{\hat{p}_{uh}(1-\hat{p}_{uh})}{n_h - 1}, \tag{7}$$

where n_{uh} is the number of coho salmon classified as age u in stratum h, n_h is the sample size, and N_h is the total number of coho salmon passing the weir during stratum h. Sex composition was estimated similarly.

Estimates of the number of coho salmon passing the weir during stratum h by age and sex ($\hat{N}_{uh}$) were calculated by expanding by the total weir count for stratum h using:

$$\hat{N}_{uh} = N_h \hat{p}_{uh}, \tag{8}$$

with associated variance:

[1] The sample size goal of 490 is slightly over the goals of 458 and 463 fish needed for estimating the age composition of the weir population. This sample size goal was obtained by applying a finite correction factor to the sample size goal of 403 given by Thompson (1987), associated with our objective criteria (i.e., α = 0.10 and d = 0.15) and then applying an expansion factor for a scale regeneration rate of approximately 15% as observed in previous surveys.

$$\hat{V}\left[\hat{N}_{uh}\right] = N_h^2 \hat{V}\left[\hat{p}_{uh}\right] . \quad (9)$$

The number of fish in the total escapement in each age and sex class ($\hat{N}_u$) was estimated by summing across strata:

$$\hat{N}_u = \sum_{h=1}^{s} \hat{N}_{uh} , \quad (10)$$

where s = the total number of 7-day strata in the season.

The variance of $\hat{N}_u$ was estimated by summing the stratum variances.

Finally, the proportion of each age and sex class across all strata ($\hat{p}_u$) was estimated as:

$$\hat{p}_u = \frac{\hat{N}_u}{N} , \quad (11)$$

with variance:

$$\hat{V}[\hat{p}_u] = \frac{\hat{V}\left[\hat{N}_u\right]}{N^2} , \quad (12)$$

where N = the total weir count across all strata.

ESCAPEMENT INDEX SURVEYS

Index counts of spawning coho salmon were conducted in 11 index streams during the peak spawning period. The 11 streams that were surveyed during 1995 were: Spring (a tributary to upper Wasilla Creek), Yellow, McRoberts, Upper Jim, Spring (a tributary to Wasilla Creek at the Palmer Hay Flats), Cottonwood, Wasilla, Rabideux, Birch, Question and Answer creeks. The peak spawning period was identified through frequent inspections of coho salmon spawning activity in the streams that were easily accessible. The surveys were conducted by foot or canoe.

The Little Susitna and Deshka rivers were not index surveyed in 1995. Only censuses at the weirs were taken.

The following data were recorded during each escapement index survey: (1) the name of the stream and the respective reach or tributary area surveyed, (2) the date and time of the survey, (3) the type of survey, (4) weather conditions during the survey, (5) the stream level or flow, (6) the relative clarity or turbidity of the water (visibility), (7) the total number of live coho salmon observed, and (8) the total number of dead coho salmon observed.

The index survey results together with historical survey data are archived in the Palmer ADF&G office stream files.

COMPUTER PROGRAMS AND DATA FILES

A list of computer data files and programs used to analyze data collected during the 1995 season is in Appendix C.

RESULTS

WEIR CENSUS

The passage of coho salmon upstream of the Little Susitna River salmon counting weir was censused from 20 May through 4 September 1995; the first coho passed the weir on 7 July (Appendix A1). A total of 12,266 coho salmon were censused.

Coho salmon were censused through the Deshka River weir (Appendix A2) from 3 July through 1 September 1995. A total of 12,824 coho salmon were censused.

HATCHERY CONTRIBUTIONS

Little Susitna River Sport Harvest

In 1995, 2,252 coho salmon were inspected for a missing adipose fin from harvests of boat anglers exiting at Burma Landing. Heads were collected from 156 coho salmon with adipose clips (Table 3). Tagged coho salmon were from three tag codes: 31-23-01, 31-21-37 and 31-21-42 (Table 3).

Table 3.-Summary of coded wire tags recovered from coho salmon in the sport harvest at the Little Susitna River, by release and 7-day strata, 1995.

Strata	Date	Heads With CWTs	Decodable CWTs[a]	Clips Observed[b]	Heads To CWT Lab	Number Inspected	Tag Code			No Tag[d]	Lost Tag[e]	Total	Tagging Proportion[f]
							01[c]	37[c]	42[c]				
1	7/16-7/22	5	5	5	5	156	5	0	0	0	0	5	-01 = 0.3459
2	7/23-7/29	29	29	32	30	441	29	0	0	1	0	30	-37 = 0.1100[g]
3	7/30-8/05	30	30	38	33	470	29	1	0	3	0	33	-42 = 0.5572
4	8/06-8/12	58	58	69	63	833	57	0	1	4	1	63	
5	8/13-8/19	21	21	23	22	218	21	0	0	1	0	22	
6	8/20-8/26	2	2	3	3	80	2	0	0	1	0	3	
7	8/27-8/28	0	0	1	0	54	0	0	0	0	0	0	
Totals		145	145	171	156	2,252	143	1	1	10	1	156	

[a] Number of heads found to have a decodable coded wire tag.

[b] Number of fish missing the adipose fin observed in the inspected sample.

[c] Tag code 31-23-01 released in 1994 at Nancy Lake; tag code 31-21-37 released in 1993 in the mainstem Little Susitna River at Houston, and tag code number 31-21-42 released in 1993 in Wasilla Creek.

[d] Tag not found in head at decoding laboratory.

[e] Tag lost at decoding laboratory.

[f] The tagged fish released/total fish released.

[g] The tagging proportion for this tag code has been corrected for long-term tag loss. The estimated value of the tagging proportion is reported in Stratton, et al. (1996).

CWTs with tag code 31-23-01 were found in 143 of the heads collected and sent to the tag lab for decoding. Fish bearing this code were released as smolt in the Little Susitna River at Nancy Lake in 1994. The other two tag codes were represented by one fish each. Release sites of these codes were the mainstem Little Susitna River at Houston in 1993 and Wasilla Creek in 1993.

The estimated proportional relative contribution from tag code 32-23-01 to the 1995 harvest of Little Susitna River coho salmon by boat anglers exiting the Burma Landing sport fishery was 20.1% (SE = 1.7%). The other two releases contributed 0.5% to the sport harvest. To estimate the total contribution to the sport harvest, this estimated proportional contribution will be applied to the 1995 harvest estimate from the Statewide Harvest Survey (SWHS) when it is published.

Little Susitna River Weir

The hatchery contribution to the 12,266 coho salmon censused at the Little Susitna River weir was 1,135 (SE = 137) fish, or 9.3% (95% C.I. = ±2.2%; Table 4). We inspected 2,516 coho salmon at the weir, which was 20.5% of the census. Of those inspected, 89 coho salmon had an adipose finclip, from which 83 heads were collected (Table 5).

Nancy Lake Egg Take

A total of 406 fish were inspected during the egg take and 118 coho salmon missing the adipose fin were observed. All 118 heads were shipped to the tag lab; 110 tags were decoded as code 31-23-01. All fish bearing this tag code were released in Nancy Lake during the spring of 1994. Eight heads had no tag. The proportional hatchery contribution to the egg take was 318 fish (78.3%).

Commercial Fishery

The hatchery contribution of coho salmon from 1993 and 1994 Little Susitna releases to selected Cook Inlet commercial fisheries was 5,832 fish (SE = 279, Cyr et al. *In prep*; Table 4).

Age, Length, and Sex Composition

At the Little Susitna River weir, 472 coho salmon were sampled for age and sex composition and mean length estimates. Four-hundred nine samples were used for the estimates; 63 (13%) were rejected for scale regeneration or missing length or sex. Age-1.1 fish were dominant at the weir, making up 56.7% (SE = 2.5%) of the census (Table 6). Mean length-at-age was not significantly different at $\alpha = 0.05\%$ for females ($t = 0.907$, $df = 153$) or for males ($t = 0.506$, $df = 252$; Table 7).

At the Deshka River, coho salmon age 2.1 made up 68.5% (SE = 2.5%) of the census (Table 8). Mean length-at-age was not significantly different at $\alpha = 0.05\%$ for females ($t = 1.334$, $df = 123$) or for males ($t = 0.748$, $df = 216$; Table 9).

Small numbers of age-1.0 and -2.0 coho salmon were present in the sport fishery during 1993 (Bartlett 1994) and probably were present in the 1994 and 1995 return as well. But because age, sex and lengths were not sampled from the 1995 sport harvest, fish from these age groups could not be observed. Age-1.0 and -2.0 coho salmon are not sampled at the weir because they can escape through the vertical 1.5-inch spaced pickets in the live trap.

The sex ratio of coho salmon sampled in the 1995 Little Susitna River weir census was 38% females and 62% males. The sex ratio in the Deshka River sample was 36% females and 64% males.

Index Surveys

Indexed streams fall into three subareas of the Northern Cook Inlet Management Area

Table 4.-Contributions of hatchery-origin coho salmon to the estimated sport fishery harvest, the census of coho salmon at the Little Susitna River weir and the Cook Inlet commercial fishery.

Year	Total Estimate	SE	Hatchery Estimate	SE	Percent	95 % C.I.
Sport Harvest (total estimates from Burma Road creel survey):						
1986	5,812	--[a]	107	30.5	1.8	
1987	13,202	442.1	3,460	509.7	26.2	± 7.8
1988	12,759	405.0	6,468	571.9	50.7	± 9.3
1989	14,150	746.3	10,660	1,275.2	75.0	± 19.3
1990	8,001	866.8	2,393	478.0	29.9	± 13.3
1991	14,079	1,297.0	6,584	1,205.7	46.8	± 18.8
1992	8,739	674.0	1,482	188.7	17.0	± 4.9
1993	11,051	779.0	3,083	288.8	27.9	± 4.3
1994	--[b]				34.9 [g]	± 12.9 [h]
1995	--[b]				20.7 [h]	± 3.4
Escapement:						
1986 [c]						
1987 [d]						
1988	21,438	--[e]	4,764	1,076.3	22.2	± 9.8
1989	15,855	--[e]	7,191	757.6	45.9	± 9.4
1990	15,511	--[e]	3,791	449.0	24.4	± 5.7
1991	39,241	--[e]	8,375	592.	21.4	± 3.0
1992	21,182	--[e]	2,468	279	11.5	± 2.6
1993	34,822	--[e]	10,211	857.6	29.4	± 4.0
1994	28,948	--[e]	5,442 [g]	717.0 [h]	18.8	± 1.8
1995	12,266	--[e]	1,135	137	9.3	± 2.2
Commercial Harvest:						
1993	--[f]	--[f]	10,852	532.8		
1994	--[f]	--[f]	19,960	1,365.7		
1995	--[f]	--[f]	5,832	279.1		

Sources: Bartlett and Vincent-Lang 1989; Bartlett and Sonnichsen 1990; Bartlett and Bingham 1991; Bartlett 1992, 1994, 1996; Stratton et al. 1996; Cyr et al. *In prep.*

[a] Standard error not reported.

[b] Harvest was not estimated by the creel survey in 1994 and 1995.

[c] No tagged fish reported.

[d] No weir in place.

[e] Measured without error.

[f] The total harvest of Little Susitna River coho salmon in the commercial fisheries of Cook Inlet is unknown.

[g] These estimates have been corrected from those reported in Bartlett (1996) due to long-term tag loss corrections reported in Stratton, et al. (1996).

[h] Procedures outlined by Bernard and Clark (*In Press*) were used to estimate standard errors of contribution estimates with an estimated tagging fraction (reported in Stratton, et al. 1996).

Table 5.-Little Susitna River coho salmon weir coded wire tag recovery summary by release and 7-day strata in 1995.

Strata	Date	Heads With CWTs	Decodable CWTs[a]	Clips Observed[b]	Heads To CWT Lab	Number Inspected	01[c]	19[c]	No Tag[d]	Total	Tagging Proportion[e]
1	7/02-7/22	7	7	14	14	294	7	0	1	8	01 = 0.3459
2	7/23-7/29	20	20	21	21	549	20	0	1	21	19 = None[f]
3	7/30-8/05	23	23	23	23	792	23	0	0	23	
4	8/06-8/12	11	11	11	11	254	11	0	0	11	
5	8/13-8/19	14	14	15	15	343	14	0	1	15	
6	8/20-8/26	2	2	2	2	217	2	0	0	2	
7	8/27-9/02	2	2	3	3	67	1	1	1	3	
Totals		79	79	89	83	2,516	78	1	4	83	

[a] Number of heads found to have a decodable coded wire tag.

[b] Number of fish missing the adipose fin observed in the inspected sample.

[c] Tag code 31-21-01 released in 1994 at Nancy Lake; tag code 19 released in the Kenai River drainage.

[d] Tag not found in head at decoding laboratory.

[e] The tagged fish released/total fish released.

[f] Tagged wild smolt with no tagging ratio available.

Table 6.-Estimated age and sex composition, summed across all strata, of coho salmon sampled from the census at the Little Susitna River weir in 1995.

	Age 1.1	Age 2.1	Total
Females:			
Number in Sample	79	76	155
Percent of Sample	19.3	18.6	37.9
SE (%)	2.0	1.9	2.4
Males:			
Number in Sample	153	101	254
Percent of Sample	37.4	24.7	62.1
SE (%)	2.4	2.1	2.4
Combined:			
Number in Sample	232	177	409
Percent of Sample	56.7	43.3	100.0
SE (%)	2.5	2.5	

Table 7.-Estimated mean length-at-age of coho salmon from a sample censused at the Little Susitna River weir in 1995.

	Age 1.1	Age 2.1	Total
Females:			
Mean Length (mm)	575.6	580.8	578.1
SE	4.1	4.1	2.9
Sample size	79	76	155
Minimum	490.0	480.0	480.0
Maximum	650.0	675.0	675.0
Males:			
Mean Length (mm)	588.7	594.4	589.8
SE	3.4	4.2	2.6
Sample size	153	101	254
Minimum	430.0	440.0	430.0
Maximum	680.0	680.0	680.0
Combined:			
Mean Length (mm)	584.3	586.9	585.4
SE	2.6	3.0	2.0
Sample size	232	177	409
Minimum	430.0	440.0	430.0
Maximum	680.0	680.0	680.0

Table 8.-Estimated age and sex composition, summed across all strata, of coho salmon sampled from the census at the Deshka River weir in 1995.

	Age 1.1	Age 2.1	Total
Females:			
Number in Sample	36	89	125
Percent of Sample	10.5	25.9	36.4
SE (%)	1.7	2.4	2.6
Males:			
Number in Sample	72	146	218
Percent of Sample	21.0	42.6	63.6
SE (%)	2.2	2.7	2.6
Combined:			
Number in Sample	108	235	343
Percent of Sample	31.5	68.5	100.0
SE (%)	2.5	2.5	

Table 9.-Estimated mean length-at-age of coho salmon from a sample censused at the Deshka River weir in 1995.

	Age 1.1	Age 2.1	Total
Females:			
Mean Length (mm)	538.6	548.7	545.8
SE	7.3	3.8	3.4
Sample size	36	89	125
Minimum	470.0	465.0	465.0
Maximum	610.0	625.0	625.0
Males:			
Mean Length (mm)	548.3	553.7	551.9
SE	5.7	4.3	3.4
Sample size	72	146	218
Minimum	445.0	430.0	430
Maximum	660.0	685.0	685
Combined:			
Mean Length (mm)	545.1	551.8	549.7
SE	4.5	3.03	2.5
Sample size	108	235	343
Minimum	445.0	430.0	430.0
Maximum	660.0	685.0	685.0

(NCIMA). These are: Knik Arm drainage streams, eastside Susitna River drainage streams, and westside Susitna River drainage streams.

All streams with planned index counts were surveyed in 1995. Survey conditions were generally good with the exception of Rabideux Creek and upper Jim Creek. Spawning areas of Rabideux Creek were flooded by extensive beaver dams and the water was too dark and deep to accurately index. Jim Creek was flooded by high water from a severe storm that cut across the Knik River valley a few days prior to the index count. As a result, many weaker coho salmon and coho salmon carcasses were washed into Leaf Lake and were not included in the index count.

Excluding the Little Susitna River, approximately 30% fewer coho salmon were indexed in Knik Arm drainage streams in 1995 than were indexed in 1994 (Table 10). The majority of eastside Susitna River drainage streams and the one westside stream (Rabideux Creek) had fewer coho salmon indexed in 1995 than in 1994 (Table 11).

The exception to the eastside streams was Answer Creek. In 1994 Answer Creek was blocked by several beaver dams and no fish were observed to have reached the index area. In 1995, 35 fish were observed to have reached the index area.

DISCUSSION

WEIR CENSUS, ESCAPEMENT GOAL AND RUN TIMING

The 1995 census of coho salmon through the Little Susitna River weir was uneventful until the last few days of operation when high water forced a temporary closure of the weir (Appendix A1). Operation was stopped at this time because the majority of the 1995 season's return had passed and the estimated number of nonhatchery stock through the weir (11,131) exceeded the escapement goal of 7,500 nonhatchery fish.

We assume that the escapement goal for the river upstream of the Parks Highway as required by the Little Susitna River coho salmon management plan was met. Nonhatchery coho salmon are harvested upstream of the weir but the numbers harvested are known to be fewer than the 3,631 nonhatchery fish difference between the number estimated at the weir and the 7,500 nonhatchery fish escapement goal (Bartlett and Vincent Lang 1989, Bartlett and Sonnichsen 1990, Bartlett and Bingham 1991).

Overall run timing in 1995 was atypical from the 1988 through 1994 mean (Figure 3). Early arriving coho salmon were in greater abundance than normally observed. This led many anglers to speculate that the 1995 in-river abundance would be above average. However, this was not the case. By 7 August the cumulative mixed-stock census fell behind the mean and by 24 August it fell behind the lowest census on record (1990). As a result, the 1995 census was the lowest census recorded between 1988 and 1995. The in-river exploitation of the stocks will not be known until the results of the Statewide Harvest Survey are released in late 1996.

The Deshka River was censused for the first time in 1995 (Appendix A2). Additional years of data collection will provide a more complete picture of run timing and magnitude on this important coho salmon stream.

AGE COMPOSITION

In 1995, mixed-stock Little Susitna River coho salmon were predominantly age 1.1 (Table 6). Because the majority of hatchery fish are known to be age 1.1, an ideal program would allow us to estimate the age

Table 10.-Escapement index counts of coho salmon in Knik Arm index streams 1981-1995.

Year	Little Susitna River[a]			Fish Creek[b]	Cotton-wood Creek	Wasilla Creek	Spring Creek (Wasilla)	Spring Creek (Flat)	Yellow Creek	McRoberts Creek	Upper Jim Creek	Eklutna Tailrace	Grand Total
	Hatchery	Non hatchery	Total										
1981			6,750	2,330	423	238	ns[c]	64	ns[c]	ns[c]	ns[c]	ns[c]	9,805
1982			6,800	5,201	737	171	ns[c]	105	ns[c]	ns[c]	ns[c]	ns[c]	13,014
1983			2,666	2,342	506	4	ns[c]	28	ns[c]	ns[c]	ns[c]	ns[c]	5,546
1984			20,991	4,510	935	876	ns[c]	90	ns[c]	ns[c]	ns[c]	ns[c]	27,402
1985			3,540	5,089	334	16	150	81	65	662	ns[c]	266	10,203
1986			7,511 [d]	2,166	121	ns[c]	141	147	20	439	ns[c]	403	10,948
1987			4,865	3,871	360	251	110	42	58	667	ns[c]	1,587	11,811
1988	4,428	16,063	20,491	2,162	293	ns[c]	82	30	110	1,911	ns[c]	1,848	26,927
1989	6,862	8,370	15,232	3,479	147	ns[c]	67	39	226	597	ns[c]	253	20,040
1990	3,370	10,940	14,310	2,673	167	34	38	12	146	599	589	668	19,236
1991	8,322	29,279	38,249	1,297	158	118	16	5	136	484	418	286	41,172
1992	2,690	19,492	21,182	1,705	6	3	11	0	57	11	59	39	23,073
1993	9,189	25,633	34,822	2,078	265	ns[c]	67	69	490	503	535	496	39,325
1994	5,442 [f]	23,506 [f]	28,948	350 [e]	232	282	76	60	172	506	2,119	714	33,459
1995	1,135	11,131	12,266	390	398	46	20	38	220	702	1,288	107	15,475

[a] Aerial or foot surveys 1981-1985 and 1987. Weir counts 1986, 1988-1995.

[b] 1982-1991 weir count plus stream survey, 1992, 1993 weir count only; 1994 weir was removed on August 15 before the majority of the coho run.

[c] No survey conducted.

[d] Weir washed out in flood from 21 July-29 July 1986.

[e] Incomplete count; the weir was removed early in the season.

[f] These estimates have been corrected from those reported in Bartlett (1996) due to long-term tag loss corrections reported in Stratton, et al. (1996).

Table 11.-Escapement index counts from aerial or foot surveys of coho salmon in Susitna River index tributaries.

Year	Rabideux Creek	Answer Creek	Question Creek	Birch Creek	Grand Total
1981	ns[a]	ns[a]	ns[a]	ns[a]	ns[a]
1982	ns[a]	ns[a]	ns[a]	ns[a]	ns[a]
1983	ns[a]	ns[a]	ns[a]	ns[a]	ns[a]
1984	480	57	60	236	833
1985	82	9	89	30	210
1986	ns[a]	ns[a]	ns[a]	25	25
1987	50[b]	10	149	46	255
1988	230	160	337	63	790
1989	20	66	31	180	297
1990	20	6	41	36	103
1991	185	51	492	300	1,028
1992	ns[a]	181	227	167	575
1993	ns[a]	34	370	178	582
1994	105	0[c]	339	224	668
1995	39	35	155	127	356

[a] No survey conducted.

[b] Poor survey conditions.

[c] Beaver dam downstream of survey area blocked upstream passage of fish.

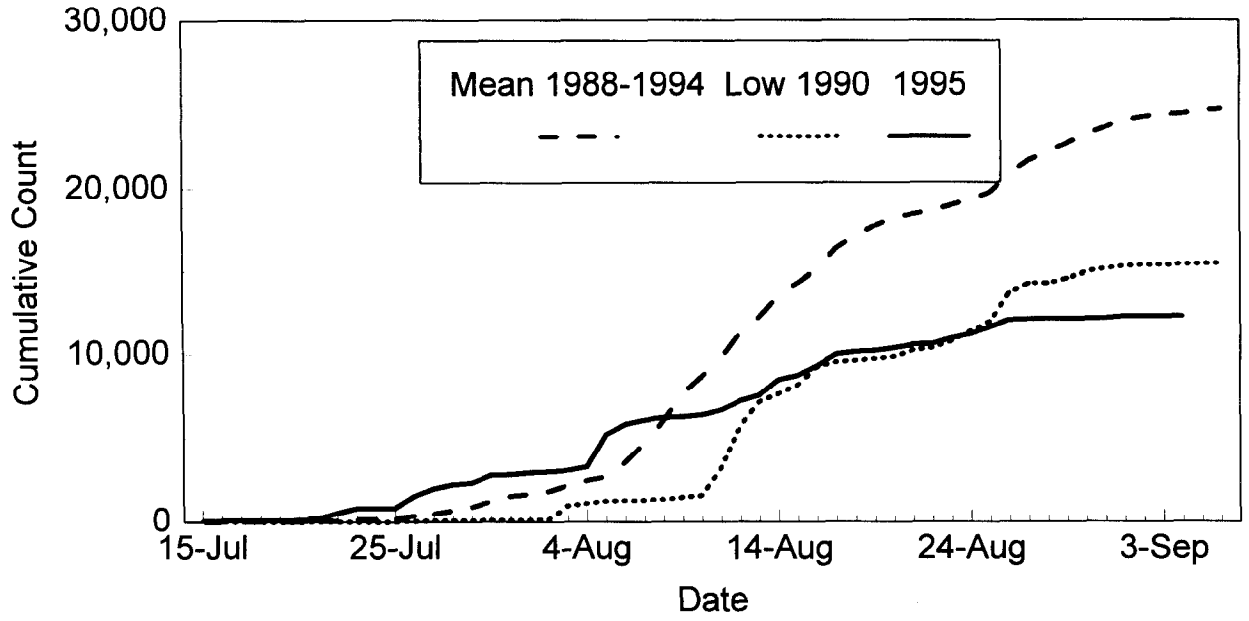

Figure 3.-Cumulative count and timing of coho salmon censused at the Little Susitna River weir in 1995, compared to the 1988-1994 mean and the record low year, 1990.

composition of the nonhatchery stock separately. About 10% of the fish sampled at the weir were hatchery fish, and separating nonhatchery fish from hatchery fish is difficult. Fish missing the adipose fin are obviously hatchery fish, but because not all hatchery fish are marked, unmarked hatchery fish in the age sample can not be distinguished from nonhatchery fish. Therefore, the age composition of the nonhatchery stock cannot be determined because applying the age composition of the mixed-stock fish to the nonhatchery fish would overestimate the proportion of age 1.1 fish.

To obtain a pure sample of nonhatchery coho salmon, the weir will be moved to a site about 10 miles upstream of Nancy Lake Creek in 1996. All returning hatchery fish are expected to return to Nancy Lake Creek, so coho salmon sampled in 1996 above Nancy Lake Creek at the new weir site should be nonhatchery fish only.

HATCHERY CONTRIBUTIONS

In 1995, the proportional contribution of hatchery fish to the sport harvest was within the historical range (Table 4). The hatchery contribution to the census at the weir was the lowest ever recorded.

The total number of hatchery coho salmon estimated to have returned to the Little Susitna River in 1995 can not be estimated until the results of the Statewide Harvest Survey for sport fisheries is published in mid to late summer, 1996. The total hatchery contribution estimate by the 1993 and 1994 Little Susitna River releases will then be the sum of estimates for the 1995 sport harvest, the 1995 census at the weir and the major 1995 Cook Inlet commercial fisheries.

It is currently not possible to estimate the total production of coho salmon from the Little Susitna River because the harvest of nonhatchery fish in the mixed-stock Cook Inlet commercial fisheries can not be

estimated without a tagging program for nonhatchery juveniles.

Coded Wire Tag Retention

The retention of coded wire tags (conversely, tag loss) in salmon smolt after release is important. Tag loss among smolt of a specific tag code just prior to release has been estimated at the hatchery since 1992. In 1994 all smolt released in the Little Susitna River were of one tag code (Table 2). The in-hatchery tag loss of this group of fish just prior to release was estimated to be approximately 1.5%. The rate of a naturally missing adipose fin in coho salmon is estimated to be approximately 0.06% in several Puget Sound, Washington streams (Blankenship 1990). The natural rate of missing adipose fins is so small that all coho salmon that were found on this project without an adipose fin were assumed to be hatchery fish.

Upon recovery in 1995, the observed tag loss within this group of fish was approximately 6% in the Burma Landing sport harvest and 5% at the weir (Tables 3 and 5).

Data on the number of coho salmon from the Nancy Lake egg take with missing CWT tags has been recorded since 1992 (L. Peltz, ADF&G, Palmer, personal communication). Tag loss in the 1992 egg take was about 2%, about 10% in 1993, about 16% in 1994, and about 9% in 1995.

Stocking

Releases were capped at no more than approximately 150,000 smolt starting in 1994. In 1995 approximately 152,000 smolt were released in the Little Susitna River drainage (Table 2). If survival falls within 5% to 10%, this stocking could produce from 7,600 to 15,200 adult coho salmon. Whether or not the 1996 inriver return from this release reaches its fullest potential, however, will ultimately depend on factors such as fresh and saltwater survival and the magnitude of harvest by the 1996 Cook Inlet commercial fisheries.

Escapement Index

Beaver *Castor canadensis* dam construction in 1995 continued to obstruct access by adult salmon to spawning areas in some NCIMA streams. Stream discharge estimates from the U.S. Geological Survey for 1995 are not yet available but staff observations are that, like 1994, the summer and fall of 1995 were, with a few exceptions, characterized by low stream flows. These low flows allowed the construction and maintenance of new and higher dams by beavers.

A large beaver dam near the mouth of the index stream Birch Creek blocked the upstream migration of salmon for most of the summer. Because the dam is in public view and the subject of repeated public requests to assist the upstream migration of salmon, it was breached by hand on several occasions.

A series of high beaver dams also blocked the index stream Rabideux Creek to where much of the flowing water in the index area was flooded.

Several large beaver dams low in the index stream Answer Creek blocked all access to the spawning areas in 1994 (Table 11). In 1995, 35 spawning adults were indexed upstream of the dams. During the spring of 1995, a fish pass was constructed to repair a severely perched culvert under the Parks Highway. Coho salmon were able to freely access spawning areas of Answer Creek upstream of the Parks Highway for the first time since 1986. During the summer of 1995 a large beaver dam was built about 1/2 mile upstream of the new fish pass. The index survey indicated that access to additional upstream spawning areas was completely blocked by this dam.

Coho salmon returns are generally composed of freshwater age-1 and -2 fish, and the loss of one year class is not considered injurious to the long-term health of returns to specific spawning streams. If returning salmon are unable to reach spawning areas for several consecutive years, future returns to specific index streams could be impacted. This is unlikely because beaver dams are normally breached by higher fall stream flows.

We recommend that indexing of Rabideux Creek be discontinued. The beaver population on Rabideux Creek is high and in excess of 50% of the index area has been flooded by beaver dams for the past several years. Most access to spawning areas is blocked and the water has become too deep and dark to see into.

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APPENDIX A. DAILY CENSUS OF PACIFIC SALMON AT THE LITTLE SUSITNA RIVER AND DESHKA RIVER WEIRS IN 1995

Appendix A1.-Daily census of Pacific salmon at the Little Susitna River weir in 1995.

Date	Chinook		Sockeye		Chum		Coho		Pink	
	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].
20-May	0	0	0	0	0	0	0	0	0	0
21-May	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0
23-May	0	0	0	0	0	0	0	0	0	0
24-May	0	0	0	0	0	0	0	0	0	0
25-May	0	0	0	0	0	0	0	0	0	0
26-May	0	0	0	0	0	0	0	0	0	0
27-May	0	0	0	0	0	0	0	0	0	0
28-May	0	0	0	0	0	0	0	0	0	0
29-May	0	0	0	0	0	0	0	0	0	0
30-May	3	3	0	0	0	0	0	0	0	0
31-May	0	3	0	0	0	0	0	0	0	0
1-Jun	3	6	0	0	0	0	0	0	0	0
2-Jun	9	15	6	6	0	0	0	0	0	0
3-Jun	6	21	13	19	0	0	0	0	0	0
4-Jun	4	25	7	26	0	0	0	0	0	0
5-Jun	19	44	11	37	0	0	0	0	0	0
6-Jun	4	48	14	51	0	0	0	0	0	0
7-Jun	7	55	6	57	0	0	0	0	0	0
8-Jun	3	58	36	93	0	0	0	0	0	0
9-Jun	1	59	30	123	0	0	0	0	0	0
10-Jun	19	78	77	200	0	0	0	0	0	0
11-Jun	397	475	45	245	0	0	0	0	0	0
12-Jun	248	723	23	268	0	0	0	0	0	0
13-Jun	17	740	4	272	0	0	0	0	0	0
14-Jun	23	763	5	277	0	0	0	0	0	0
15-Jun	15	778	17	294	0	0	0	0	0	0
16-Jun	1	779	20	314	0	0	0	0	0	0
17-Jun	0	779	33	347	0	0	0	0	0	0
18-Jun	36	815	66	413	0	0	0	0	0	0
19-Jun	546	1,361	25	438	0	0	0	0	0	0
20-Jun	240	1,601	34	472	0	0	0	0	0	0
21-Jun	30	1,631	19	491	0	0	0	0	0	0
22-Jun	8	1,639	21	512	0	0	0	0	0	0
23-Jun	69	1,708	15	527	0	0	0	0	0	0
24-Jun	47	1,755	18	545	0	0	0	0	0	0
25-Jun	3	1,758	4	549	0	0	0	0	0	0
26-Jun	1	1,759	7	556	0	0	0	0	0	0
27-Jun	31	1,790	6	562	0	0	0	0	0	0
28-Jun	213	2,003	13	575	0	0	0	0	0	0
29-Jun	81	2,084	9	584	0	0	0	0	0	0
30-Jun	44	2,128	2	586	0	0	0	0	0	0
1-Jul	47	2,175	6	592	1	1	0	0	0	0
2-Jul	37	2,212	2	594	0	0	0	0	0	0
3-Jul	136	2,348	6	600	2	3	0	0	0	0
4-Jul	9	2,357	0	600	1	4	0	0	0	0
5-Jul	102	2,459	3	603	3	7	0	0	0	0
6-Jul	9	2,468	0	603	4	11	0	0	0	0
7-Jul	212	2,680	2	605	4	15	4	4	0	0
8-Jul	21	2,701	6	611	8	23	2	6	0	0
9-Jul	17	2,718	16	627	13	36	2	8	0	0
10-Jul	5	2,723	7	634	21	57	4	12	0	0
11-Jul	8	2,731	3	637	25	82	2	14	0	0
12-Jul	4	2,735	4	641	12	94	1	15	1	1
13-Jul	7	2,742	6	647	15	109	2	17	3	4
14-Jul	13	2,755	12	659	62	171	8	25	4	8
15-Jul	31	2,786	21	680	39	210	60	85	7	15
16-Jul	5	2,791	8	688	26	236	13	98	5	20
17-Jul	2	2,793	1	689	17	253	0	98	1	21
18-Jul	12	2,805	2	691	45	298	2	100	0	21
19-Jul	2	2,807	57	748	113	411	19	119	0	21
20-Jul	10	2,817	60	808	56	467	11	130	2	23
21-Jul	1	2,818	279	1,087	703	1,170	87	217	6	29
22-Jul	0	2,818	1,105	2,192	1,165	2,335	306	523	105	134

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Date	Chinook		Sockeye		Chum		Coho		Pink	
	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].
23-Jul	3	2,821	582	2,774	1,727	4,062	291	814	40	174
24-Jul	0	2,821	59	2,833	81	4,143	3	817	0	174
25-Jul	1	2,822	533	3,366	514	4,657	8	825	6	180
26-Jul	3	2,825	684	4,050	1,748	6,405	718	1,543	50	230
27-Jul	8	2,833	394	4,444	1,003	7,408	447	1,990	57	287
28-Jul	5	2,838	350	4,794	904	8,312	244	2,234	20	307
29-Jul	3	2,841	119	4,913	543	8,855	92	2,326	20	327
30-Jul	7	2,848	344	5,257	818	9,673	446	2,772	64	391
31-Jul	13	2,861	214	5,471	265	9,938	56	2,828	16	407
1-Aug	3	2,864	309	5,780	548	10,486	110	2,938	22	429
2-Aug	9	2,873	182	5,962	407	10,893	51	2,989	14	443
3-Aug	1	2,874	133	6,095	454	11,347	87	3,076	27	470
4-Aug	0	2,874	105	6,200	508	11,855	206	3,282	47	517
5-Aug	0	2,874	113	6,313	497	12,352	1,953	5,235	293	810
6-Aug	1	2,875	55	6,368	352	12,704	607	5,842	47	857
7-Aug	1	2,876	83	6,451	157	12,861	252	6,094	18	875
8-Aug	1	2,877	80	6,531	133	12,994	153	6,247	11	886
9-Aug	1	2,878	17	6,548	104	13,098	37	6,284	10	896
10-Aug	1	2,879	59	6,607	173	13,271	129	6,413	19	915
11-Aug	1	2,880	39	6,646	201	13,472	274	6,687	41	956
12-Aug	0	2,880	34	6,680	126	13,598	546	7,233	22	978
13-Aug	0	2,880	30	6,710	68	13,666	321	7,554	12	990
14-Aug	2	2,882	16	6,726	70	13,736	934	8,488	18	1,008
15-Aug	2	2,884	18	6,744	48	13,784	264	8,752	3	1,011
16-Aug	0	2,884	27	6,771	61	13,845	548	9,300	1	1,012
17-Aug	0	2,884	25	6,796	83	13,928	711	10,011	5	1,017
18-Aug	0	2,884	33	6,829	49	13,977	141	10,152	4	1,021
19-Aug	0	2,884	58	6,887	51	14,028	69	10,221	2	1,023
20-Aug	0	2,884	60	6,947	85	14,113	143	10,364	4	1,027
21-Aug	0	2,884	16	6,963	34	14,147	206	10,570	1	1,028
22-Aug	0	2,884	24	6,987	24	14,171	47	10,617	2	1,030
23-Aug	0	2,884	36	7,023	45	14,216	329	10,946	0	1,030
24-Aug	0	2,884	27	7,050	15	14,231	262	11,208	0	1,030
25-Aug	0	2,884	26	7,076	21	14,252	411	11,619	5	1,035
26-Aug	0	2,884	17	7,093	6	14,258	429	12,048	3	1,038
27-Aug	0	2,884	7	7,100	5	14,263	57	12,105	0	1,038
28-Aug	0	2,884	9	7,109	3	14,266	21	12,126	0	1,038
29-Aug	0	2,884	3	7,112	3	14,269	7	12,133	0	1,038
30-Aug	0	2,884	1	7,113	2	14,271	2	12,135	0	1,038
31-Aug	0	2,884	10	7,123	15	14,286	27	12,162	0	1,038
1-Sep[b]	0	2,884	6	7,129	8	14,294	101	12,263	0	1,038
2-Sep[b]	0	2,884	0	7,129	0	14,294	2	12,265	0	1,038
3-Sep[b]	0	2,884	0	7,129	2	14,296	1	12,266	0	1,038
4-Sep[b]	0	2,884	0	7,129	0	14,296	0	12,266	0	1,038

[a] Cumulative numbers of salmon.

[b] Weir was partially submerged by flood waters on 2 and 3 September. Last day of operation was 4 September 1995.

Appendix A2.-Daily census of Pacific salmon and northern pike at the Deshka River weir in 1995.

Date	Chinook		Coho		Sockeye		Chum		Pink		Northern Pike	
	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].
20-May	0	0	0	0	0	0	0	0	0	0	0	0
21-May	1	1	0	0	0	0	0	0	0	0	1	1
22-May	2	3	0	0	0	0	0	0	0	0	2	3
23-May	0	3	0	0	0	0	0	0	0	0	0	3
24-May	0	3	0	0	0	0	0	0	0	0	0	3
25-May		3				Weir submerged 0800 hours.						3
26-May		3				Weir submerged.						3
27-May		3				Weir submerged.						3
28-May		3				Weir submerged.						3
29-May		3				Weir fish tight at 2000 hours.						3
30-May	4	7	0	0	0	0	0		0	0	1	4
31-May	5	12	0	0	0	0	0	0	0	0	1	5
1-Jun	7	19	0	0	0	0	0	0	0	0	0	5
2-Jun	2	21	0	0	0	0	0	0	0	0	0	5
3-Jun	3	24	0	0	0	0	0	0	0	0	0	5
4-Jun	6	30	0	0	0	0	0	0	0	0	0	5
5-Jun	0	30	0	0	0	0	0	0	0	0	0	5
6-Jun	3	33	0	0	0	0	0	0	0	0	1	6
7-Jun	3	36	0	0	0	0	0	0	0	0	0	6
8-Jun	8	44	0	0	0	0	0	0	0	0	0	6
9-Jun	3	47	0	0	0	0	0	0	0	0	0	6
10-Jun	2	49	0	0	0	0	0	0	0	0	0	6
11-Jun	10	59	0	0	0	0	0	0	0	0	0	6
12-Jun	15	74	0	0	0	0	0	0	0	0	0	6
13-Jun	9	83	0	0	0	0	0	0	0	0	0	6
14-Jun	23	106	0	0	0	0	0	0	0	0	0	6
15-Jun	30	136	0	0	0	0	0	0	0	0	0	6
16-Jun	107	243	0	0	0	0	0	0	0	0	0	6
17-Jun	180	423	0	0	0	0	0	0	0	0	0	6
18-Jun	1,676	2,099	0	0	0	0	0	0	0	0	0	6
19-Jun	878	2,977	0	0	0	0	0	0	0	0	0	6
20-Jun	2,585	5,562	0	0	0	0	0	0	0	0	0	6
21-Jun	254	5,816	0	0	0	0	0	0	0	0	0	6
22-Jun	319	6,135	0	0	0	0	0	0	0	0	0	6
23-Jun	38	6,173	0	0	0	0	0	0	0	0	0	6
24-Jun	12	6,185	0	0	0	0	0	0	0	0	0	6
25-Jun	147	6,332	0	0	0	0	0	0	0	0	0	6
26-Jun	9	6,341	0	0	0	0	0	0	0	0	0	6
27-Jun	3	6,344	0	0	0	0	0	0	0	0	0	6
28-Jun	338	6,682	0	0	0	0	0	0	0	0	0	6
29-Jun	885	7,567	0	0	0	0	0	0	0	0	0	6
30-Jun	11	7,578	0	0	0	0	0	0	0	0	0	6

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Date	Chinook		Coho		Sockeye		Chum		Pink		Northern Pike	
	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].
1-Jul	311	7,889	0	0	0	0	0	0	0		0	6
2-Jul	74	7,963	0	0	0	0	0	0	0	0	0	6
3-Jul	169	8,132	1	1	0	0	0	0	0	0	0	6
4-Jul	227	8,359	0	1	1	0	0	0	0	0	0	6
5-Jul	96	8,455	0	1	0	1	0	0	0	0	0	6
6-Jul	23	8,478	2	3	0	1	0	0	0	0	0	6
7-Jul	323	8,801	0	3	0	1	0	0	0	0	0	6
8-Jul	132	8,933	0	3	0	1	0	0	0	0	0	6
9-Jul	72	9,005	0	3	0	1	0	0	0	0	0	6
10-Jul	7	9,012	1	4	0	1	0	0	0	0	0	6
11-Jul	41	9,053	0	4	0	1	0	0	0	0	0	6
12-Jul	73	9,126	4	8	0	1	0	0	1	1	0	6
13-Jul	16	9,142	2	10	0	1	0	0	3	4	0	6
14-Jul	131	9,273	4	14	1	2	0	0	4	8	0	6
15-Jul	12	9,285	0	14	0	2	0	0	2	10	0	6
16-Jul	51	9,336	3	17	0	2	0	0	0	10	0	6
17-Jul	3	9,339	0	17	0	2	0	0	0	10	0	6
18-Jul	46	9,385	1	18	0	2	0	0	2	12	0	6
19-Jul	17	9,402	6	24	2	4	0	0	27	39	0	6
20-Jul	13	9,415	0	24	0	4	0	0	9	48	0	6
21-Jul	5	9,420	1	25	0	4	0	0	7	55	0	6
22-Jul	3	9,423	4	29	2	6	0	0	160	215	0	6
23-Jul	8	9,431	5	34	1	7	0	0	171	386	0	6
24-Jul	0	9,431	0	34	0	7	0	0	29	415	0	6
25-Jul	4	9,435	65	99	129	136	1	1	379	794	0	6
26-Jul	6	9,441	37	136	228	364	0	1	1,104	1,898	0	6
27-Jul	4	9,445	1,136	1,272	361	725	0	1	5,134	7,032	0	6
28-Jul	4	9,449	476	1,748	137	862	0	1	4,024	11,056	0	6
29-Jul	0	9,449	57	1,805	39	901	0	1	2,875	13,931	0	6
30-Jul	18	9,467	374	2,179	71	972	0	1	2,701	16,632	0	6
31-Jul	18	9,485	92	2,271	36	1,008	0	1	268	16,900	0	6
1-Aug	14	9,499	73	2,344	16	1,024	0	1	295	17,195	0	6
2-Aug	27	9,526	196	2,540	41	1,065	0	1	1,496	18,691	0	6
3-Aug	20	9,546	452	2,992	39	1,104	0	1	998	19,689	0	6
4-Aug	17	9,563	478	3,470	31	1,135	0	1	2,398	22,087	0	6
5-Aug	23	9,586	751	4,221	14	1,149	0	1	2,620	24,707	0	6
6-Aug	58	9,644	1815	6,036	31	1,180	0	1	3,975	28,682	0	6
7-Aug	15	9,659	149	6,185	9	1,189	0	1	576	29,258	0	6
8-Aug	17	9,676	150	6,335	7	1,196	0	1	1,038	30,296	0	6
9-Aug	50	9,726	368	6,703	10	1,206	0	1	1,479	31,775	0	6
10-Aug	41	9,767	468	7,171	19	1,225	2	3	918	32,693	0	6

-continued-

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Date	Chinook		Coho		Sockeye		Chum		Pink		Northern Pike	
	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].	Daily	Cum[a].
11-Aug	51	9,818	495	7,666	14	1,239	0	3	1,948	34,641	0	6
12-Aug	61	9,879	365	8,031	22	1,261	0	3	2,542	37,183	0	6
13-Aug	59	9,938	759	8,790	27	1,288	0	3	2,271	39,454	2	8
14-Aug	43	9,981	612	9,402	9	1,297	0	3	4,016	43,470	1	9
15-Aug	18	9,999	299	9,701	7	1304	0	3	256	43,726	0	9
16-Aug	8	10,007	347	10,048	2	1,306	0	3	189	43,915	0	9
17-Aug	4	10,011	35	10,083	3	1,309	0	3	88	44,003	0	9
18-Aug	14	10,025	253	10,336	22	1,331	0	3	238	44,241	0	9
19-Aug	5	10,030	69	10,405	13	1,344	0	3	133	44,374	0	9
20-Aug	0	10,030	172	10,577	7	1,351	0	3	112	44,486	1	10
21-Aug	4	10,034	90	10,667	7	1,358	0	3	66	44,552	0	10
22-Aug	4	10,038	10	10,677	1	1,359	1	4	14	44,566	0	10
23-Aug	2	10,040	91	10,768	3	1,362	0	4	7	44,573	5	15
24-Aug	1	10,041	152	10,920	10	1,372	0	4	14	44,587	1	16
25-Aug	1	10,042	235	11,155	4	1,376	0	4	4	44,591	0	16
26-Aug	2	10,044	156	11,311	1	1,377	0	4	1	44,592	0	16
27-Aug	0	10,044	51	11,362	0	1,377	0	4	0	44,592	0	16
28-Aug	0	10,044	341	11,703	2	1,379	0	4	0	44,592	1	17
29-Aug	1	10,045	48	11,751	2	1,381	0	4	2	44,594		17
30-Aug	0	10,045	28	11,779	3	1,384	0	4	1	44,595	2	19
31-Aug	0	10,045	513	12,292	3	1,387	0	4	0	44,595	0	19
1-Sep	3	10,048	532	12,824	1	1,388	1	5	0	44,595	0	19
2-Sep					High water, Weir submerged - no count							
3-Sep					High water, Weir submerged - no count							
4-Sep					High water, Weir submerged - no count							

[a] Cumulative numbers of salmon.

APPENDIX B. CREEL INSPECTION SCHEDULE FOR 1995 LITTLE SUSITNA RIVER SURVEY OF THE BOAT ANGLERS AND THEIR HARVEST

Appendix B1.-Days and hours of creel inspection for hatchery-marked coho salmon in the Little Susitna River boat angler sport harvest during 1995.

Date	Day	Hours of Inspection	Hours/day Surveyed	Minimum Number Expected[a]
16-Jul	Sun	1000-1242 1343-1743	6.7	18
17-Jul	Mon	1000-1242 1343-1743	6.7	17
18-Jul	Tue	OFF		
19-Jul	Wed	OFF		
20-Jul	Thu	OFF		
21-Jul	Fri	1000-1242 1343-1743	6.7	27
22-Jul	Sat	1000-1242 1343-1743	6.7	74
23-Jul	Sun	1000-1242 1343-1743	6.7	97
24-Jul	Mon	1000-1242 1343-1743	6.7	92
25-Jul	Tue	OFF		
26-Jul	Wed	OFF		
27-Jul	Thu	OFF		
28-Jul	Fri	1000-1242 1343-1743	6.7	133
29-Jul	Sat	1000-1242 1343-1743	6.7	129
30-Jul	Sun	1000-1242 1343-1743	6.7	196
31-Jul	Mon	1000-1242 1343-1743	6.7	107
01-Aug	Tue	OFF		
02-Aug	Wed	OFF		
03-Aug	Thu	OFF		
04-Aug	Fri	1000-1242 1343-1743	6.7	210
05-Aug	Sat	1000-1242 1343-1743	6.7	484
06-Aug	Sun	1000-1242 1343-1743	6.7	360
07-Aug	Mon	1000-1242 1343-1743	6.7	182
08-Aug	Tue	OFF		
09-Aug	Wed	OFF		
10-Aug	Thu	OFF		
11-Aug	Fri	1000-1242 1343-1743	6.7	100
12-Aug	Sat	1000-1242 1343-1743	6.7	52
13-Aug	Sun	1000-1242 1343-1743	6.7	90
14-Aug	Mon	1000-1242 1343-1743	6.7	65
15-Aug	Tue	OFF		
16-Aug	Wed	OFF		
17-Aug	Thu	OFF		
18-Aug	Fri	1000-1242 1343-1743	6.7	102
19-Aug	Sat	1000-1242 1343-1743	6.7	50
20-Aug	Sun	1000-1242 1343-1743	6.7	60
21-Aug	Mon	1000-1242 1343-1743	6.7	28
22-Aug	Tue	OFF		
23-Aug	Wed	OFF		
24-Aug	Thu	OFF		
25-Aug	Fri	1000-1242 1343-1743	6.7	31
26-Aug	Sat	1000-1242 1343-1743	6.7	19
27-Aug	Sun	1000-1242 1343-1743	6.7	31
28-Aug	Mon	1000-1242 1343-1743	6.7	3
29-Aug	Tue	OFF		
30-Aug	Wed	OFF		
31-Aug	Thu	OFF		
01-Sep	Fri	1000-1242 1343-1743	6.7	3
02-Sep	Sat	1000-1242 1343-1743	6.7	3
			Total	2,763

[a] The minimum number of fish expected to be examined in 1995 is based on returns to the landing in 1994 during the 1994 hours of inspection.

APPENDIX C. COMPUTER DATA FILES AND ANALYSIS PROGRAMS

Appendix C1.-Computer data files and analysis programs developed for the coho salmon escapement studies on the Little Susitna River and Deshka River, 1995.

Data Files[a]	
K004DBB5.DTA	Data file of coho salmon biological data collected at the Little Susitna River weir in 1995.
N003WBB5.DTA	Data file of coho salmon biological data collected at the Deshka River weir in 1995.
Analysis Programs[b]	
CWT3.EXE	Program used to estimate the contribution of hatchery fish in the 1995 Little Susitna River weir census by strata.
LSU94RHC.WK4	Worksheet used to estimate the relative contribution of hatchery fish in the 1995 sport fish harvest by boat anglers through Burma Landing.
SFXTAB.EXE	Program used to cross-tabulate biological data files and produce tables of age, sex, length, and weight data.
MENU91.BAT	Series of programs used to generate listing and frequency reports from raw data.

[a] Data files are archived with the Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Unit, 333 Raspberry Road, Anchorage, Alaska 99518. Contact Gretchen Jennings or Donna Buchholz (267-2369) for copies of the files and descriptions of the file format.

[b] Analysis programs and worksheets are maintained by the Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Unit, 333 Raspberry Road, Anchorage, Alaska 99518. Contact Allen Bingham (267-2369) for copies of the programs.